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Studies of Local Environment Surrounding Co Atoms in a Structural Phase Transition of $\text{TiO}_2\text{:Co}$ Nanocrystal Ferromagnetic Semiconductors

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Local structure around Co and crystal structure of TiO_2 in Co-doped TiO_2 nanocrystal ferromagnetic semiconductors have been investigated using x-ray absorption fine structure and powder diffraction techniques. The magnetic Co impurity atoms have been found to substitute for Ti in an anatase-like local environment through a structural phase transition when the host material changes from an amorphous phase to a mixture of anatase and rutile crystal structures and then to a rutile structure as a result of increasing anneal temperature. The change in host crystal structure from anatase to rutile, while local structure around Co remains anatase-like, is believed to be responsible for a hindered ferromagnetic exchange interaction in the nanocrystals. This result reveals an interesting feature that the local structure around magnetic impurity atoms can remain practically unchanged while the material undergoes drastic structural variations and loss of room-temperature ferromagnetism.

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References: Y. L. Soo, G. Kioseoglou, S. Kim, Y. H. Kao, P. Sujatha Devi, John Parise, R. J. Gambino, and P. I. Gouma "Local Environment Surrounding Magnetic Impurity Atoms in a Structural Phase Transition of Co-Doped TiO_2 Nanocrystal Ferromagnetic Semiconductors" *Appl. Phys. Lett.* **81**, 655-657

